

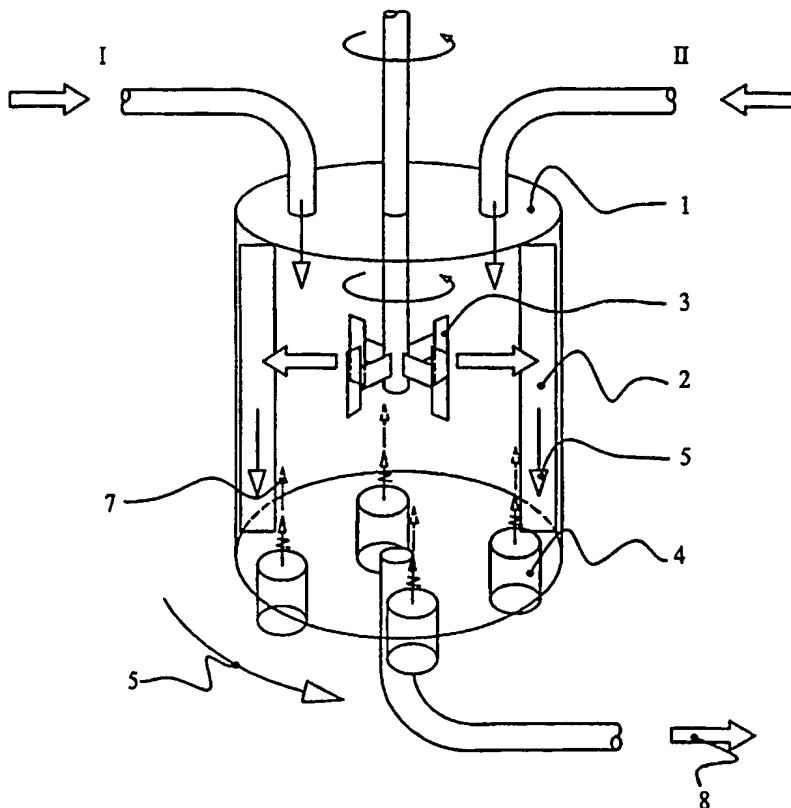
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<p>(21) International Application Number: PCT/DK00/00088</p> <p>(22) International Filing Date: 2 March 2000 (02.03.00)</p> <p>(30) Priority Data: PA 1999 00296 5 March 1999 (05.03.99) DK</p> <p>(71) Applicant (for all designated States except US): RESON A/S [DK/DK]; Fabriksvangen 13, DK-3550 Slangerup (DK).</p> <p>(72) Inventors; and</p> <p>(75) Inventors/Applicants (for US only): FROM, Peter, Sendal [DK/DK]; Tøndergade 24, 4 th, DK-1752 København V (DK). PETERSEN, Helge, V. [DK/DK]; Hulgårdsvej 25, DK-3300 Frederiksværk (DK). MELBY, Poul [DK/DK]; Baunetoften 47, DK-3320 Skævinge (DK). HARALDSTED, Hans, H. [DK/DK]; Ellegaardspark 19, DK-3520 Farum (DK).</p> <p>(74) Agent: HARALDSTED, Hans, H.; Ing.-& Handelsfirma, Ellegaardspark 19, Postbox 107, DK-3520 Farum (DK).</p>		<p>(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published In English translation (filed in Danish). Without international search report and to be republished upon receipt of that report.</p>

(54) Title: METHOD AND APPARATUS FOR AN OPTIMUM INTEGRATED PROCESS OF HOMOGENISING

(57) Abstract

Method as an apparatus for continuous homogenising or emulsification of liquid (I as II), where liquid (I as II) in an ultrasound chamber (1) with lamellas (2) or guiding plates (2), especially placed in the outer edge or wall of the chamber (1), but also with even a placing in the field up to this, has been subjected a cinematic mechanical treatment as an example by stirring (3), and with a continuous flow of liquid, which has been guided past the surface of more ultrasound transducers (4), where the transducers (4) are driven in a displaced succession (5), with a least one transducer (4) in shift, which is in rest.



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Method and apparatus for an optimum integrated process of homogenising

The invention relates to a method as an apparatus for continuous homogenising or emulsification of liquid, where the liquid in a ultrasound chamber with lamellas or guiding plates, especially placed on the outer walls of the chamber, but also possibly with a place in the area up to this, can be submitted to a cinematic- mechanical treatment, as an example by stirring , and with an continuous stream, which subsequently is guided over the surface of several ultrasound generators.

10 Hitherto has it according to the US patent no. 3.614.069 been known to use ultrasound for emulsification or mixing by using varying frequencies and intensity. The disadvantage has here been that every single ultrasound transducer has been overloaded too much by and with a continuous and simultaneous driving of the
15 whole arrangement of ultrasound transducers, why every single generator has not been able to drive with an optimum yield , and with this, with an optimum effect. Another disadvantage by the American system according to US. Patent no. 3.614.069 is that it there by the mentioned construction and drifting method is unable to create or induce cavitation by high pressure, which just is known as the working
20 conditions, which our actually invention optimum will be able to work under and by this generally our force of the invention.

Hitherto have there also according to the German patent no. 14.44.377 been known to use apparatus, where lamellas are mounted direct on the outer wall for bettering a
25 mechanical stirring.

The disadvantage by this stationary system has especially been that the plates of the lamellas or the baffles only have been working as break for forced liquid stroking streaming. Where there in front and around these baffles then have been made an indirect mixing and a partial emulsification.

30 Has there then further, as mentioned in the German patent, been mounted horizontal laying plate rings, then will this arrangement restrain a necessary continuous flow of liquid down to the active surfaces of the ultra sound generators.

The purpose with the invention is to show a method as an apparatus of the in the beginning mentioned sort, as one now by this obtains, to be able to higher and essential better the given effect, for one by this optimum formed emulsion and homogenising of the actually liquids or viscous materials, which continuous have
5 been guided to a mixer chamber. In the same time one obtain also not less to be able to drive the cavitation under very high pressure in the actually ultrasound chamber.

According to the invention, this can be obtained respectively by a driving form for ultra sound transducers, and by the establish dynamic-physical state of the
10 lamellas, and characteristic of, that a majority of transducers are driven in displaced succession, while at least in change one transducer is in rest, as that the lamellas during work can be given a rotating movement.

Concerning to the ultrasound heads the function of invention will be shown under
15 the driving. As one via our invention and the method for a specified transducer head can use higher effect than earlier known by "normally" driving, where one drive continuously. As one according to method and the invention by driving continuous let one ultrasound head of a quantity rest in shift.

There has by this been obtained that the ultrasound head can cool down, before its
20 critical temperature for destruction has been reached. Another advantage is also that the ultrasound head and its electrical resistance is lowering by cooling, why there further also here has been obtained an advantage. Among other things that one now can couple as drive the ultrasound heads more stabile, inside a lesser range of temperature.

25 A further advantage is also that one, by continuous shift between the heads, further can obtain a higher degree of efficiency of the arrangement. As a shift and stop will change the condition of cavitation, so that the cavitation or emulsification can be more effective or maintain optimum driving in the liquid.

30 In a specially embodiment of the arrangement, according to the invention, then can one further increase the cavitation as emulsification of the liquid by driving the system under conditions of working, with or under extreme high pressure of

working, as an example 16 bar, and with time of stay of the premix in the field of ultrasound on ideal about 20-25 seconds. -Where one so in the same time here in or on every single transducer further use pulsing signals of ultrasound, with essential higher maximum impulses, which are higher here than the actually transducer would allow by a continuous driven.

There has here been obtained that the system can be driven under very adverse conditions of cavitation, which the high pressure, as the generally short time of working, has been given. And in the same time with condition, - with pulsing ultrasound signals, with higher maximum impulse obtain to be able to get an extreme large effect of cavitation, and with this an optimum emulsification as homogenisation of the liquid in the chamber of the mixing.

In another specially embodiment of the arrangement according to the invention, then work the system in the mixing chamber with homogenisation as emulsification, with a working pressure on about 16 bar, and with pulsing ultrasound signals, with higher maximum pulses, than every single transducer by continuous driven can hold. And with further a running resting/ driving function, mentioned "rif" of the transducers, and with also one in the same time pulsing driving or working between 15-120 kHz, or on an ideal working situation on between 20-50 kHz, for a flow of liquid on ideal 4000 litres pr. hour.

There have here been obtained that the driving or working in or with the mentioned limits of frequencies, and within the mentioned way to drive, optimise and make it possible for a continuous homogenising as emulsification of generally specific flows of liquids or quantities of liquid mass in an actually size of mixing chamber.

In another specially embodiment of the arrangement according to the invention, then can one let the lamellas rotate.

One obtain by this further a cavitation effect, which come from the stroke of the liquid against the rotating single lamella or lamella ring or from similar arrangement. As the speed of the liquid further by the stroke has been accelerated / decelerated dependent of the direction of the rotating as the point of the stroke.

In another embodiment of the arrangement according to the invention, then can further one in the same time rotation be obtained of both the rings of the lamellas, which hold the single lamellas. And the lamellas can also be brought to rotate around its own axle.

- 5 One obtain further by this an effect of homogenisation. Which specially could be intensified by the choice of direction of rotating, and the speed of the rotating of the lamellas and the ring itself. And this could even be opposite of each other, or with different speed of rotating.
- 10 In another embodiment of the arrangement according to the invention, then can further the effect of emulsification be further increased of, - via that shape of the rotating lamellas have been twisted as a spiral in the length direction of the lamella itself.
- One have by this then obtained that the returning stroke of the liquid from the
- 15 rotating lamella, and seen from the direction of length, then do not get the same picture in the cut or section of length. And in the same time, the liquid will not only be thrown horizontal out, but it will be thrown in slanting direction according to the pitch of the shape of the spiral of the single lamellas itself. And because of the lamella rotate, then will the next quantity of liquid take another direction. Why an
- 20 optimum emulsification by this treatment has been obtained.

The invention shall after this be explained in the following under reference to the drawing, where

25

Fig.1 shows in perspective a ultrasound chamber for homogenisation as emulsification of liquid, with guiding plates and driving or working of the ultrasound transducers in displaced order ,-

30

Fig.2 shows a ring of lamella- or guiding plates, which rotate together or jointly around or in the centre axle of the ultrasound chamber,-

Fig.3 shows in perspective and seen from the side a single vertical lamella-or guiding plate, which rotate around itself,-

- 5 Fig.3B shows a single rotating lamella-or guiding plate as Fig.3, but seen from upper, and

Fig.4 shows a picture of pulsing guiding ultrasound signals.

10

Fig.1 Shows in perspective a ultrasound chamber 1 for homogenisation as emulsification of liquid(s) I as II, with guiding plates 2 and working or driven of ultrasound transducers 4 which self each and together work in displaced order.

- 15 The figure shows an example of an embodiment with vertical placed chamber 1 or boiler 1, which self also in the same time make a pressure safe chamber of mixing 1.

From above in the mixing chamber 1 according to the figure (Fig.1) can there ideally as an example be lead liquid respectively I as II, as one want mixed and
20 homogenised for a total leaving mix 8, as an example an emulsion 8.

The liquids I as II, which in the example of embodiment have been supplied from above in the chamber of mixing 1, will immediately after this be influenced of an arrangement of wheel of scoop 3. Where the just now partly mixed liquid I as II via the wheels of scoops 3 will be thrown against the guiding plates 2, and in the
25 same time, because of the liquids I as II continuous have been supplied from above via supply lines,- then will the partly homogenised liquid be led against the bottom of the chamber 1 to the exhauster pipe 8, and to continued treatment via the ultrasound transducers 4.

- 30 The ultrasound arrangement 4 can as shown on the figure ideal as an example consist of four ultrasound transducers 4. Which as an example could work in the field from 18-120 kHz, but still as here ideal as an example in the field from 20 -50 kHz.

An ideal cycle of mutual working operation for the transducers 4 will be by a continuous mutual changing 5 as "rif" 5 between these. So that some of the transducers 4 drive, and other transducers 4 do not drive.

- 5 As an example with that one drive or work with three transducers 4 at a time, and so successive working or driving of the common system of the transducers 4. As an example by turning or shift one transducer 4 ahead in the common transducer system, and as an example and alternative by turning or shift 5 against the watch. And as an example ideal by driving three transducers 4 at a time. Where for that
10 matter the one transducer 4 continuous in its "rif" 5 or changing will be new.

The advantages by this driving form 5 will be that one will lower the effect of the "cross-talk" . Which will say that the transducers 4 works as receiver of mechanical energy there have been transformed to electrical energy. And in such a way end as
15 heat in the electrical generators there drive the transducers 4.

With the shown special shift or operation 5 and according to the invention, so give this driving form 5 a possibility to regular cooling of the transducers 4. And this will make a better stability of the impedance as the resonance effect of the whole system. And moreover this driving form 5 or working form 5 will extend the living time of
20 total the equipment 4.

By further driving the transducers 4 with a pulsing cavitation 7, then you obtain in addition an optimal and total homogenising of the to the mix-chamber 1 supplied liquids I as II and even fluid mass too. As one then, qua this method 7, by a pulsing
25 cavitation combined with a "rif"- driving of the transducers itself, and under high working pressure as an example 16 bar obtain to make an extreme dense or homogen field of cavitation. And then where this field can be maintained of the following "week" signals 10.

30 Fig.2 shows a ring of lamellas -or guiding plates 2, which rotate 9 together or joint around/in the centre axle of the ultrasound chamber1.

The system 2 could consist of as an alternative several rotating 9 ring systems or rims 9' with vertical sitting plates of lamellas-or guiding plates 2. Where these 2 or the rims 9' then perhaps alternative ideal could drive or work opposite each other 2, as 9', or perhaps with different speed or both working operations in combination.

5

When the plates of lamellas or guiding plates 2 rotate 9, then will this cause an extra mixing of the supplied liquids I as II. And especially if the supplied liquids I as II in advantage already have been blended by an arrangement of paddle wheels 3 in the middle of mix-chamber 1.

10

Fig.3 shows in perspective and seen from the side a single vertical lamella-or guiding plate 2, which rotate around itself.

The arrangement 2 could of cause also be combined with the system, which is shown in Fig.2.

15 The system will especially has an extra effect, if the system turn opposite of, what the arrangement of middle rings system 3 do.

Fig.4 shows a picture of a pulsing 7 ultrasound signal 10, which drive or work as a whole. And which drive as a part of the "rif"- driving of the ultrasound transducers 4, namely in a displace succession 5, with one transducer 4 in rest, by
20 which there, by this summing up driving, has been obtained a specially effect namely a "synergi"-effect, in the effectiveness of the total effect of homogenising. And which effect therefore is larger than one logical could think, with or by every one of the single section-operations or working forms 5 as 7, "looked" driven for itself and
25 without the other working form as supplement .

30

Claims

1. Method for continuous homogenising or emulsifying of liquids (**I as II**), where the liquid (**I as II**) in a ultrasound chamber (**1**) with lamellas (**2**) or
5 guiding plates (**2**), especially placed in the outer edge or wall of the chamber (**1**) , - but also fields up to this,- have been submitted a cinematic treatment as an example by stirring or mixing(**3**),- and where the liquids (**I and II**) in a continuous stream has been guided past the surface on more generators of ultrasound transducers (**4**), **characteristic of**, that a majority of ultrasound transducers (**4**) drive or work
10 in a displaced succession (**5**), with a least one transducer (**4**) in change, and which in the same time is in rest.

2. Ultrasound apparatus for continuous homogenising according claim 1, **characteristic of**, to be able to increase the cavitation as the emulsifying of
15 the liquid (**I as II**), by driving the system under conditions of working with or under extreme pressure of working ideal as an example 16 bar, and with delaying times on ideal about 20-25 seconds, and where one or you in the same time on each single transducer (**4**) use pulsing ultrasound signals (**7**) with essential higher maximum impulses (**10**) , which are higher (**10**) than the actually transducer (**4**) would allow
20 under a continuous drift .

3. Ultrasound apparatus for continuous homogenising according to claim 1 as 2, **characteristic of**, that one drive the pulsing ultrasound signals (**7**) as resting/driving functional -"rif" (**5**), and with one in the same time frequency (**10'**) on
25 between 15-120 kHz, or ideal normally on between 20-50 kHz.

4. Ultrasound apparatus for continuous homogenising according claim 1 , **characteristic of**, that the lamellas (**2**) in the mixing chamber (**1**) under drift can be given a rotation movement (**19**)
30

5. Ultrasound apparatus for continuous homogenising according to claim 1, **characteristic of**, to have one as several rings of lamellas (**9'**) in the

mixing chamber (1) , which can rotated (9) around itself or themselves, alternative to have one as more rings of lamellas (9'), where every single lamella (2) can rotate around itself, and as alternative an embodiment, where one can combine both rotation systems together.

5

6. Ultrasound apparatus for continuous homogenising according to claim 1, **characteristic of**, that every lamella (2) or single of them, in the mixing chamber (1), in itself can be made twisted or made in a shape of spiral or in a like
10 embodiment or shape.

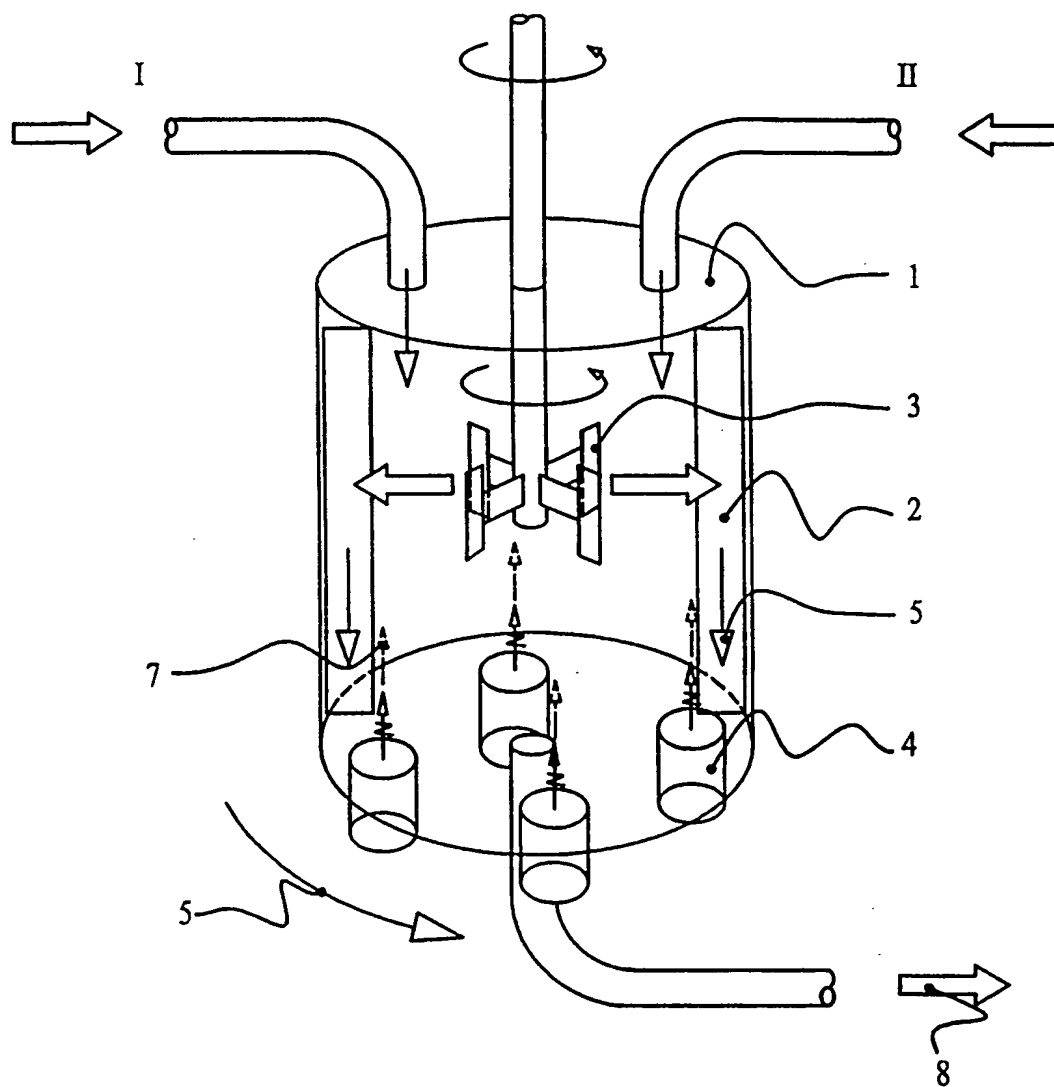
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1/3

Fig.1

2/3

Fig.2

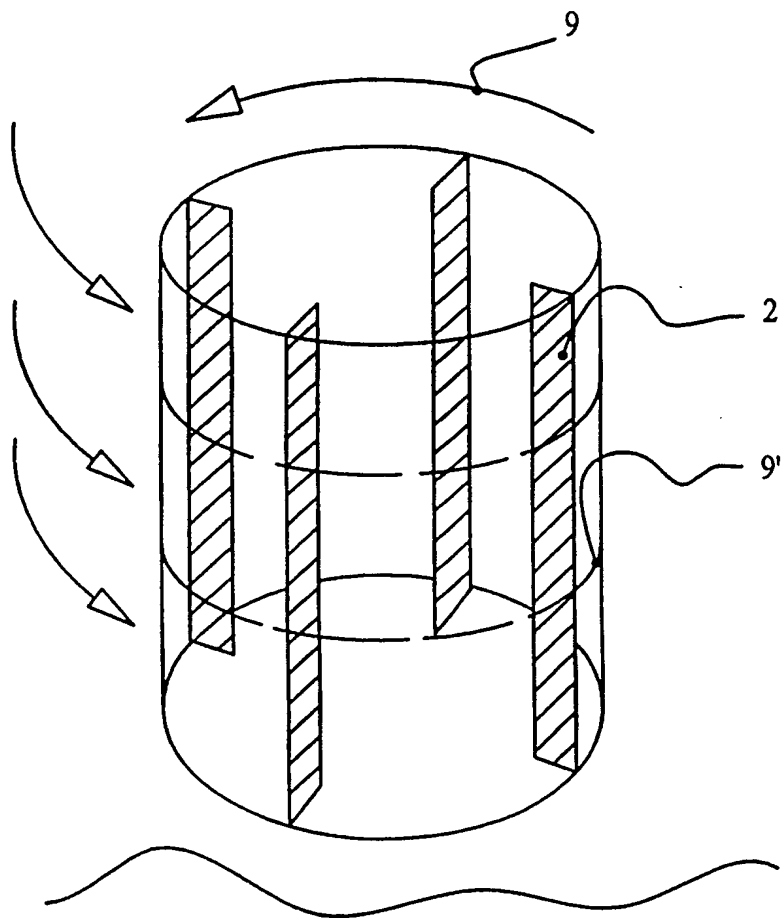


Fig.3

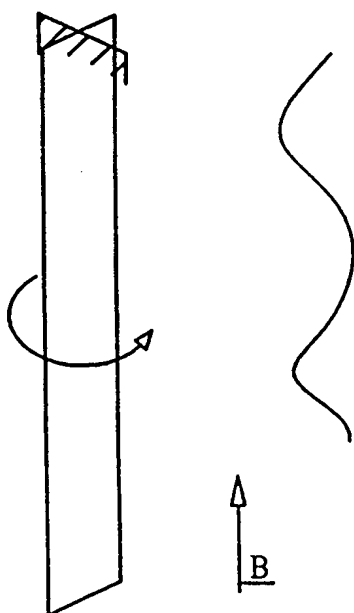


Fig.3B

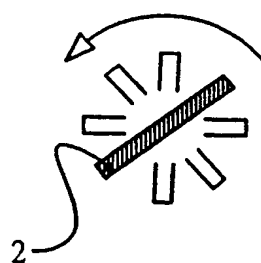
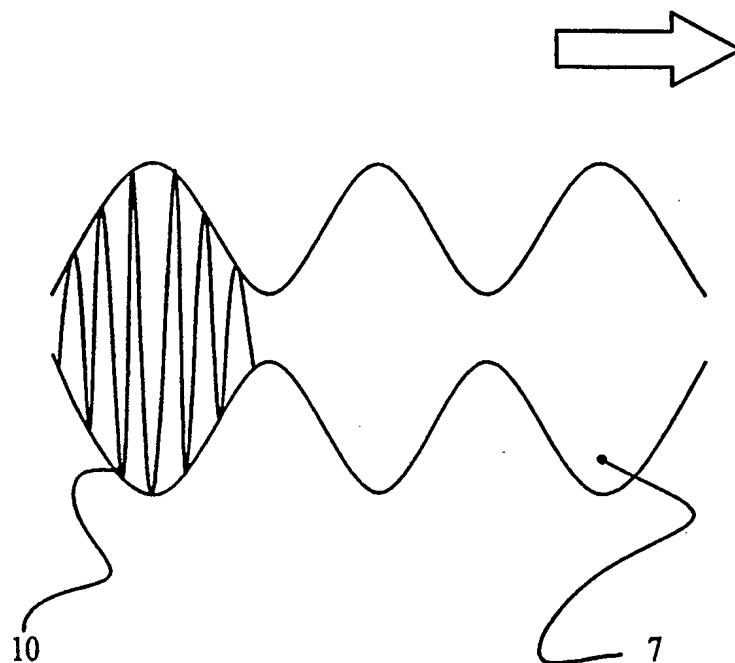


Fig.4



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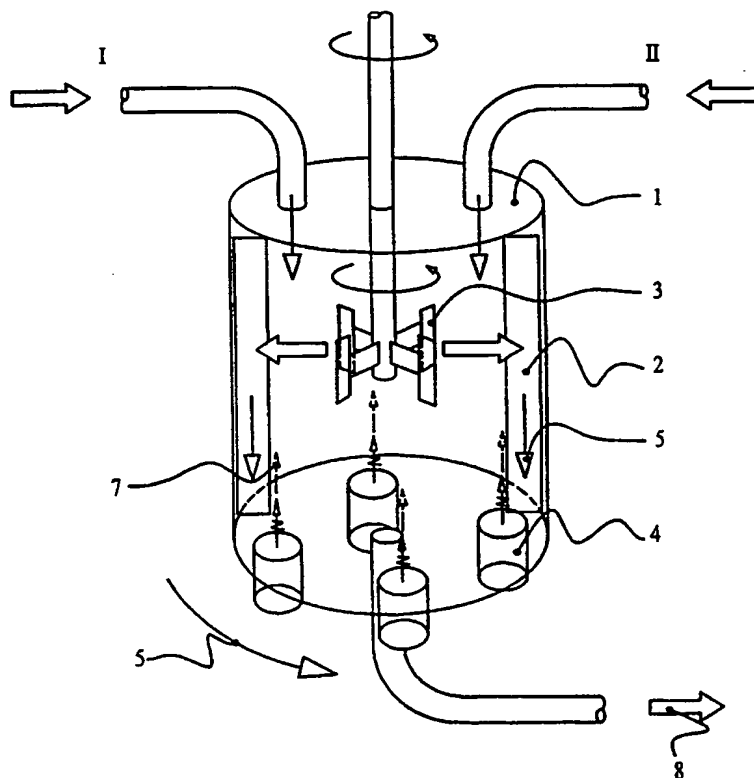
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[Continued on next page]

(54) Title: **METHOD AND APPARATUS FOR CONTINUOUS HOMOGENISING OF LIQUID IN AN ULTRASOUND CHAMBER**



(57) Abstract: Method and an apparatus for continuous homogenising or emulsification of liquid (I, II), where liquid (I, II) in an ultrasound chamber (1) with lamellas (2) or guiding plates (2), especially placed close to the outer wall of the chamber (1), has been subjected to a cinematic mechanical treatment, e.g. by stirring (3), and with a continuous flow of liquid, which has been guided past the surface of a number of ultrasound transducers (4), where the transducers (4) drive in a succession (5), where at least one transducer (4) is resting.

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SE 412702 B (RESON SYSTEM APS), 17 March 1980 (17.03.80), figures 1,2, claim 1 -- -----	1

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

27 July 2000

Date of mailing of the international search report

30 -08- 2000

Name and mailing address of the ISA:

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
SE 412702 B	17/03/80	NONE	

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Date of mailing (day/month/year) 01 November 2000 (01.11.00)	
International application No. PCT/DK00/00088	Applicant's or agent's file reference
International filing date (day/month/year) 02 March 2000 (02.03.00)	Priority date (day/month/year) 05 March 1999 (05.03.99)
Applicant FROM, Peter, Sendal et al	

1. The designated Office is hereby notified of its election made:

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01 October 2000 (01.10.00)

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Applicant's or agent's file reference International application No. PCT/DK00/00088 Applicant Reson System A/S et al	Date of mailing (day/month/year) 30 -08- 2000 FOR FURTHER ACTION See paragraphs 1 and 4 below International filing date (day/month/year) 02-03-2000
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 The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):
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3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
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 - ☐ no decision has been made yet on the protest: the applicant will be notified as soon as a decision is made.
4. Further action(s): The applicant is reminded of the following:
 - Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.
 - Within 19 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later). ~ 2005 2001
 - Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the ISA/
Patent- och registreringsverket
Box 5055
S-102 42 STOCKHOLM
Facsimile No. 08-667 72 88

Telex
17978
PATOREG-S

Authorized officer

Staffan Rennermalm

Telephone No. 08-782 25 00

COPY

(See notes on accompanying sheet)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/DK 00/00088	International filing date (day/month/year) 2 March 2000	(Earliest) Priority Date (day/month/year) 5 March 1999
Applicant Reson System A/S et al		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (See Box I).
2. ☐ Unity of invention is lacking (See Box II).
3. ☐ The international application contains disclosure of a nucleotide and/or amino acid sequence listing and the international search was carried out on the basis of the sequence listing
 - ☐ filed with the international application.
 - ☐ furnished by the applicant separately from the international application,
 - ☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
 - ☐ transcribed by this Authority.
4. With regard to the title, ☐ the text is approved as submitted by the applicant.
☒ the text has been established by this Authority to read as follows:

Method and apparatus for continuous homogenising of liquid in an ultrasound chamber.
5. With regard to the abstract,
 - ☐ the text is approved as submitted by the applicant.
 - ☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. The figure of the drawings to be published with the abstract is:
 Figure No. 1 ☒ as suggested by the applicant. ☐ None of the figures.
☐ because the applicant failed to suggest a figure.
☐ because this figure better characterizes the invention.

COPY

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

Method and an apparatus for continuous homogenising or emulsification of liquid (I, II), where the liquid (I, II) in an ultrasound chamber (1) with lamellas (2) or guiding plates (2), especially placed close to the outer wall of the chamber (1), has been subjected to a cinematic mechanical treatment, e.g. by stirring (3), and with a continuous flow of liquid, which has been guided past the surface of a number of ultrasound transducers (4), where the transducers (4) drive in a succession (5), where at least one transducer (4) is resting.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 00/00088

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B01F 11/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SE 412702 B (RESON SYSTEM APS), 17 March 1980 (17.03.80), figures 1,2, claim 1	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

- * Special categories of cited documents:
- * "A" document defining the general state of the art which is not considered to be of particular relevance
- * "B" earlier document but published on or after the international filing date
- * "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- * "C" document referring to an oral disclosure, use, exhibition or other means
- * "P" document published prior to the international filing date but later than the priority date claimed

- * "I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- * "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- * "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- * "&" document member of the same patent family

Date of the actual completion of the international search

27 July 2000

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Date of mailing of the international search report

30 -08- 2000

Authorized officer

Wiva Asplund/ELY
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT
Information on patent family members

02/12/99

International application No.

PCT/DK 00/00088

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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SE 412702 B

17/03/80

NONE

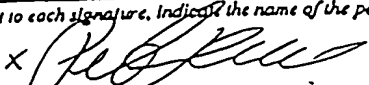
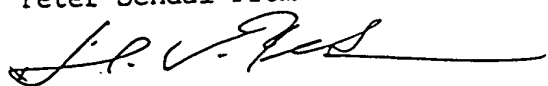

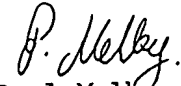
Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: regional Office	International application: receiving Office
item (1) 05 03 1999	PA 1999 00296	Denmark		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s):

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY			
Choice of International Searching Authority (ISA) (If two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):		Request to use results of earlier search; reference to that search (If an earlier search has been carried out by or requested from the International Searching Authority):	
ISA/ SE		Date (day/month/year)	Number Country (or regional Office)

Box No. VIII CHECK LIST; LANGUAGE OF FILING	
This international application contains the following number of sheets: request : 4 description (excluding sequence listing part) : 5 claims : 1 abstract : 1 drawings : 3 sequence listing part of description : Total number of sheets : 14	This international application is accompanied by the item(s) marked below: 1. <input checked="" type="checkbox"/> fee calculation sheet 2. <input type="checkbox"/> separate signed power of attorney 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: 4. <input type="checkbox"/> statement explaining lack of signature 5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): 6. <input checked="" type="checkbox"/> translation of international application into (language): (english) 7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material 8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form 9. <input type="checkbox"/> other (specify):
Figure of the drawings which should accompany the abstract: 1	Language of filing of the international application: english

Box No. IX SIGNATURE OF APPLICANT OR AGENT	
Next to each signature, indicate the name of the person signing and the capacity in which the person signs (If such capacity is not obvious from reading the request).	
x  Peter Sendal From  Helge V. Petersen	x  Hans H. Haraldsted x  Poul Melby Hans H. Haraldsted (agent)

For receiving Office use only		2. Drawings: <input type="checkbox"/> received: <input type="checkbox"/> not received:
1. Date of actual receipt of the purported international application: RO/DK-2 MARCH 2000		
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
5. International Searching Authority (if two or more are competent): ISA/ SE	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.	

Date of receipt of the record copy by the International Bureau:	COPY
Form PCT/RO/101 (last sheet) (July 1998; reprint January 2000)	
See Notes to the request form	

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 25 JUN 2001

WIPO

PCT

Applicant's or agent's file reference Homogenisator	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/DK00/00088	International filing date (day/month/year) 02.03.2000	Priority date (day/month/year) 05.03.1999
International Patent Classification (IPC) or national classification and IPC ₇ B 01 F 11/02		
Applicant Reson A/S et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 01.10.2000	Date of completion of this report 14.06.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer Wiva Asplund/ELY Telephone No. 08-782 25 00

Form PCT/IPEA/409 (cover sheet) (January 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/DK00/00088

I. Basis of the report**1. With regard to the elements of the international application:***

- ☒ the international application as originally filed
- ☐ the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the claims:
pages _____, as originally filed
pages _____, as amended (together with any statement) under article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the drawings:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.

International application No.

PCT/DK00/00088

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-6	YES
	Claims		NO
Inventive step (IS)	Claims	1-6	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-6	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

Cited SE 412702 B discloses a method for continuous homogenising or emulsifying of liquids, where the liquids in an ultrasound chamber have been submitted a cinematic treatment and have been guided past the surface of one or more generators of ultrasound transducers.

The characterizing features in present claim 1, that the ultrasound transducers work in a displaced succession with at least one transducer in change, and which in the same time is in rest, are not disclosed in the cited document. This arrangement obtains a high degree of efficiency.

Therefore, the claimed invention is novel, is considered to involve an inventive step and to be industrially applicable.

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No. PCT/DK 00/00088

International Filing Date 02 MARCH 2000



Danish Patent and Trademark Office

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference (if desired) (12 characters maximum)

Box No. I TITLE OF INVENTION

Method and apparatus for an optimum integrated proces of homogenising

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

RESON A/S

Fabriksvangen 13

DK 3550 Slangerup
Denmark☐ This person is also inventor.

Telephone No.

+45 47380022

Facsimile No.

+45 47380066

Teleprinter No.

State (that is, country) of nationality:

Denmark

State (that is, country) of residence:

Denmark

This person is applicant for the purposes of:



all designated States



all designated States except the United States of America



the United States of America only



the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

Peter Sendal From

Tøndergade 24, 4 th

DK-1752 København V
Denmark

This person is:



applicant only



applicant and inventor



inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

Denmark

State (that is, country) of residence:

Denmark

This person is applicant for the purposes of:



all designated States



all designated States except the United States of America



the United States of America only



the States indicated in the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:



agent



common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

HANS H. HARALDSTED,

ING.-& HANDELSFIRMA

Ellegaardspark 19, Postbox 107

DK 3520 Farum, Denmark

Telephone No.

+ 45 44952267

Facsimile No.

+ 45 44952267

Teleprinter No.

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

CONFIRMATION COPY

Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

Helge V. Petersen

Hulgårdsvej 25

DK- 3300 Frederiksværk
Denmark

This person is:

☐ applicant only

☒ applicant and inventor

☒ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

Denmark

State (that is, country) of residence:

Denmark

This person is applicant for the purposes of:

☐ all designated States

☐ all designated States except the United States of America

☒ the United States of America only

☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

Poul Melby

Baunetoften 47

DK-3320 Skævinge
Denmark

This person is:

☐ applicant only

☒ applicant and inventor

☒ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

Denmark

State (that is, country) of residence:

Denmark

This person is applicant for the purposes of:

☐ all designated States

☐ all designated States except the United States of America

☒ the United States of America only

☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

Hans H. Haraldsted

Ellegaardspark 19

DK-3520 Farum
Denmark

This person is:

☐ applicant only

☒ applicant and inventor

☒ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

Denmark

State (that is, country) of residence:

Denmark

This person is applicant for the purposes of:

☐ all designated States

☐ all designated States except the United States of America

☒ the United States of America only

☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

☐ applicant only

☐ applicant and inventor

☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

☐ all designated States

☐ all designated States except the United States of America

☐ the United States of America only

☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

- ☐ AP ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☐ EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☐ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|--|--|
| <input checked="" type="checkbox"/> AE United Arab Emirates | <input checked="" type="checkbox"/> LR Liberia |
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LS Lesotho |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> LT Lithuania |
| <input checked="" type="checkbox"/> AT Austria | <input checked="" type="checkbox"/> LU Luxembourg |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> MA Morocco |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> BG Bulgaria | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BR Brazil | |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> MX Mexico |
| <input checked="" type="checkbox"/> CN China | <input checked="" type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> CR Costa Rica | <input checked="" type="checkbox"/> NZ New Zealand |
| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> CZ Czech Republic | <input checked="" type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> DE Germany | <input checked="" type="checkbox"/> RO Romania |
| <input checked="" type="checkbox"/> DK Denmark | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> DM Dominica | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> EE Estonia | <input checked="" type="checkbox"/> SE Sweden |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> FI Finland | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> SK Slovakia |
| <input checked="" type="checkbox"/> GD Grenada | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TM Turkmenistan |
| <input checked="" type="checkbox"/> GM Gambia | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> HR Croatia | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
| <input checked="" type="checkbox"/> HU Hungary | <input checked="" type="checkbox"/> TZ United Republic of Tanzania |
| <input checked="" type="checkbox"/> ID Indonesia | <input checked="" type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> IL Israel | <input checked="" type="checkbox"/> UG Uganda |
| <input checked="" type="checkbox"/> IN India | <input checked="" type="checkbox"/> US United States of America |
| <input checked="" type="checkbox"/> IS Iceland | |
| <input checked="" type="checkbox"/> JP Japan | <input checked="" type="checkbox"/> UZ Uzbekistan |
| <input checked="" type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> VN Viet Nam |
| <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> YU Yugoslavia |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | <input checked="" type="checkbox"/> ZA South Africa |
| | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> KR Republic of Korea | Check-boxes reserved for designating States which have become party to the PCT after issuance of this sheet: |
| <input checked="" type="checkbox"/> KZ Kazakhstan | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> LC Saint Lucia | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> LK Sri Lanka | |

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: regional Office	international application: receiving Office
item (1) 05 03 1999	PA 1999 00296	Denmark		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s):

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA/ SE

Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year)

Number

Country (or regional Office)

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following number of sheets:

request : 4
description (excluding sequence listing part) : 5
claims : 1
abstract : 1
drawings : 3
sequence listing part of description :
Total number of sheets : 14

This international application is accompanied by the item(s) marked below:

1. ☒ fee calculation sheet
2. ☐ separate signed power of attorney
3. ☐ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☒ translation of international application into (language): (english)
7. ☐ separate indications concerning deposited microorganism or other biological material
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☐ other (specify):

Figure of the drawings which should accompany the abstract: 1

Language of filing of the international application: english

Box No. IX SIGNATURE OF APPLICANT OR AGENT

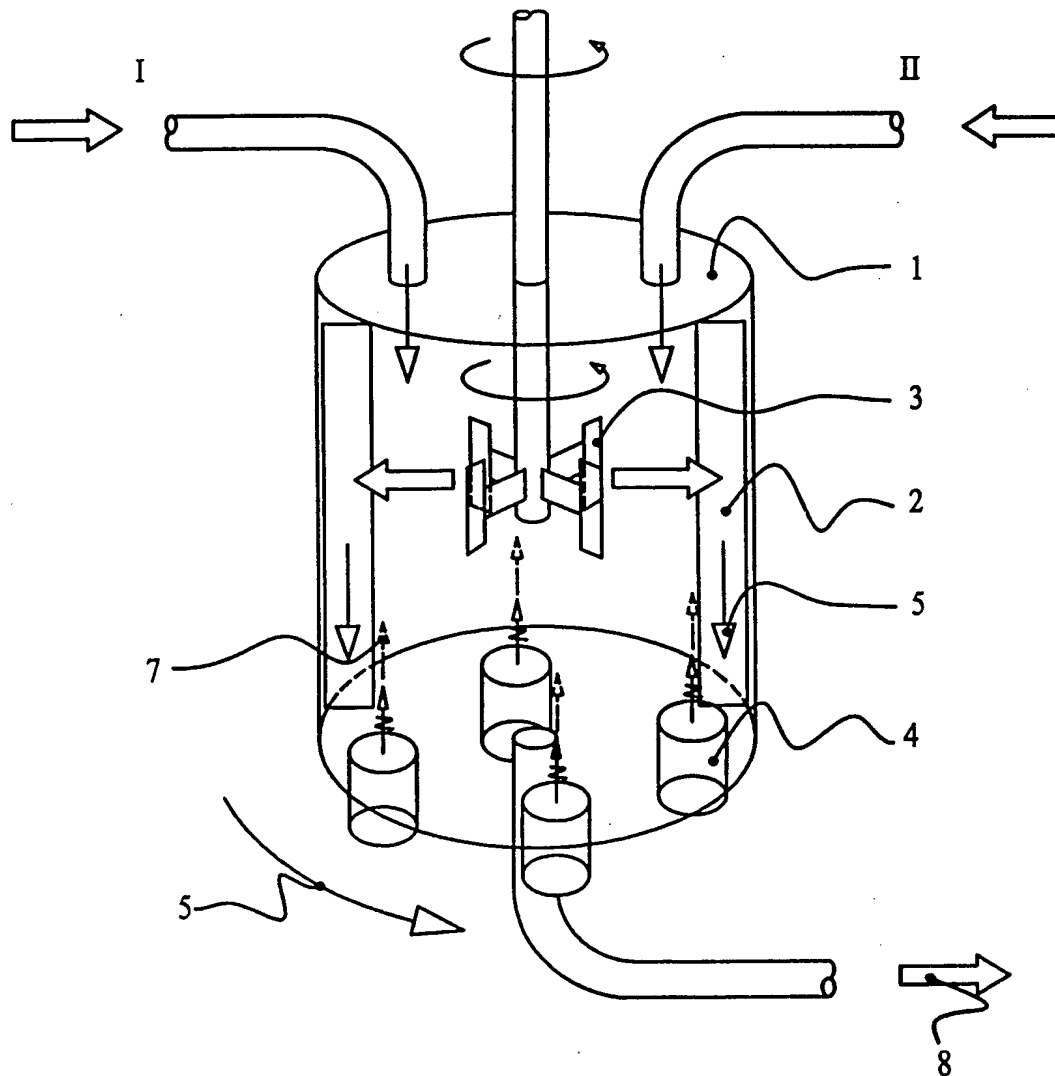
Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

Hans H. Haraldsted (agent)

For receiving Office use only		2. Drawings: <input type="checkbox"/> received: <input type="checkbox"/> not received:
1. Date of actual receipt of the purported international application: RO/DK - 2 MARCH 2000		
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
5. International Searching Authority (if two or more are competent): ISA/ SE	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.	

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Date of receipt of the record copy by the International Bureau: 21 MARCH 2000	(21.03.00)

Fig.1



2/3

Fig.2

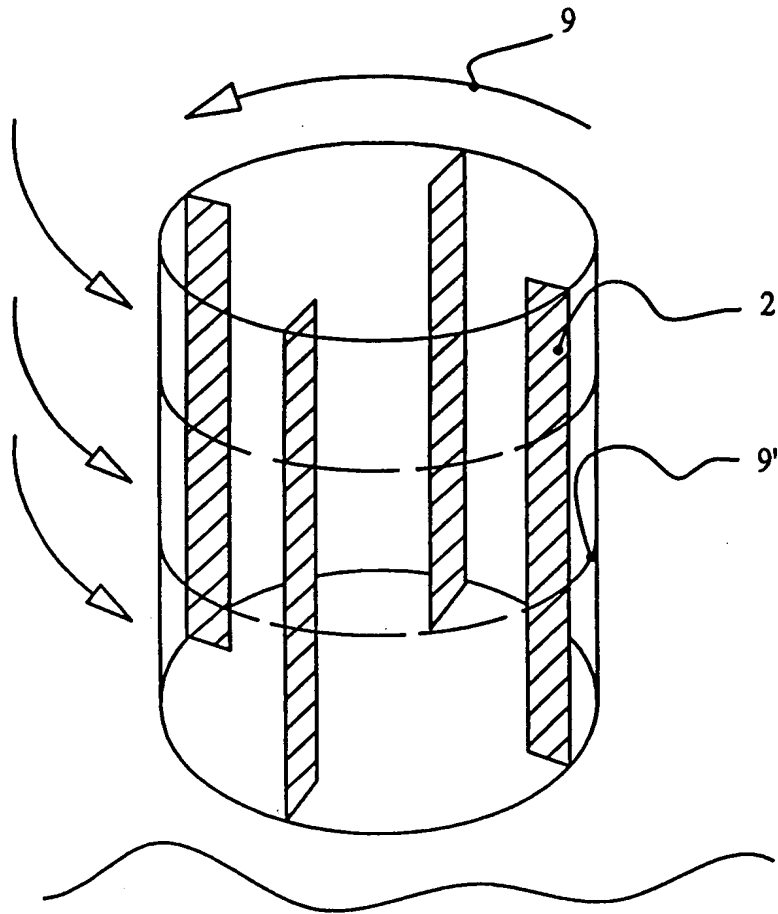


Fig.3

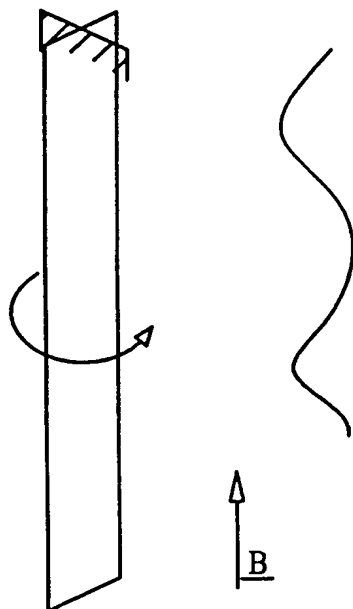


Fig.3B

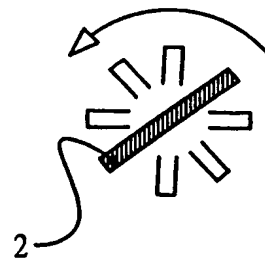
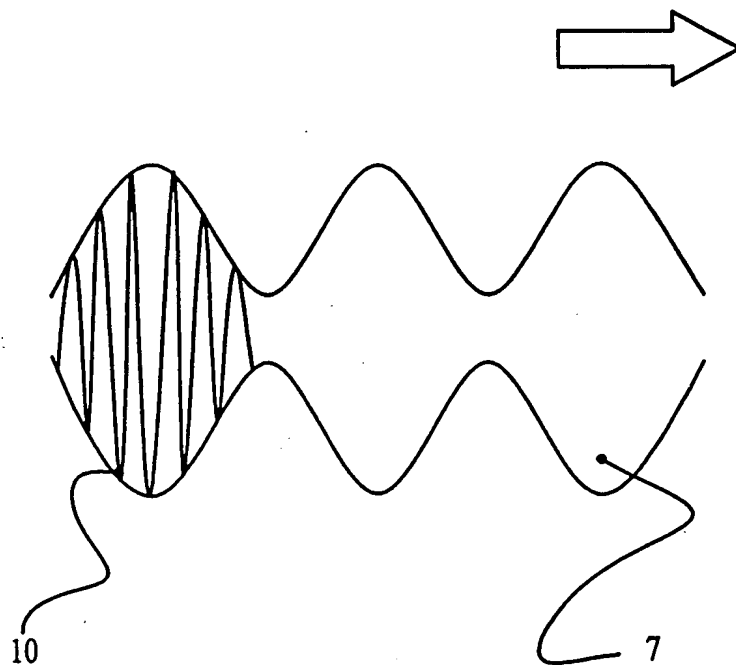


Fig.4



Fremgangsmåde og apparatur for en optimal integreret homogeniseringsproces.

- 5 Opfindelsen angår en fremgangsmåde som et apparatur for kontinuerlig homogenisering eller emulgering af væske, hvor væsken i et ultralydskammer med lameller eller ledeplader, især placeret i yderranden af kammeret, men også eventuelt med en placering i områder op hertil, underkastes en kinematisk-mekanisk behandling eksempelvis ved omrøring, 10 og med en kontinuerlig væskestrøm som herefter ledes forbi overfladen på flere ultralydsgeneratorer.

Hidtil har det jævnfør US patent nr. 3.614.069 været kendt at benytte ultralyd til emulgering eller blanding, idet man her har benyttet varierende frekvenser og intensitet. 15

Ulempen har her været, at hver enkelt ultralydstransducer har været belastet for meget ved og med en kontinuerlig drift af hele ultralydsarrangementet samtidig, hvorfor hver enkelt generator ikke har kunne køre med en optimal ydelse, og hermed med en optimal afgiven effekt.

20 En anden væsentlig ulempe er også ved det amerikanske system jævnfør US pat. Nr. 3.614.069, at der ved nævnte konstruktion og kørselsform ikke kan skabes eller opstartes en kavitation ved høje tryk, som netop er kendetegnede for de arbejdsforhold og generelt vor force som vor aktuelle opfindelse optimalt vil kunne arbejde under.

25 Hidtil har det også jævnfør tysk patent nr. 14.44.377 været kendt, at anvende apparaturer, hvor der er placeret lameller monteret direkte på ydervæggen for at bedre en mekanisk omrøring.

Ulempen ved dette stationære system har især været, at lamelpladerne eller 30 prelpladerne, kun har virket som stop for en tvunget væskebestrygning. Hvor der foran og omkring disse så har foregået en indirekte mixing som en delvis emulgering.

Monteres der så yderligere som angivet i det tyske patent vandret liggende pladeringe, så vil dette arrangement være med til at hæmme et nødvendig 35 kontinuerlig fremadgående væskeflow ned mod overfladen af ultralydsgeneratorernes virkefront.

Formålet med opfindelsen er at anvise en fremgangsmåde som et apparatur af den indledningsvis nævnte art, idet man hermed opnår, at kunne øge samt 40 væsentligt forbedre den afgivne effekt, for en herved optimal dannelse af en væskeemulgering som en homogenisering af de aktuelle væsker eller væskelignende stoffer som kontinuert tilføres et blandekammer. Samtidig opnår man også ikke mindst, at kunne køre med kavitation under meget høje arbejdstryk i et aktuelle blandekammer

45 Dette opnås ifølge opfindelsen, henholdsvis ved en kørselsform for ultralydstransducerne som ved den etablerede dynamiske-fysiske tilstand af

lamellerne, og kendetegnet ved, at et flertal af transducerne kører i forskudt rækkefølge, med mindst een transducer i skift som er i hvile, som at lamellerne under drift kan bibringes en roterende bevægelse

- 5 Virkemåden af opfindelsen i henhold til ultralydshovederne vil vise sig under kørsel. Idet man via vor opfindelse og fremgangsmåde for et specifikt transducerhoved kan benytte en højere effekt end tidligere kendt ved "normal" kørsel, hvor man kører kontinuert. Idet man jævnfør fremgangsmåden og opfindelsen kontinuert ved kørsel lader et
10 ultralydshoved af en mængde på skift hvile.-

Der opnås herved, at ultralydshovedet kan nå at køle af, før dets kritiske temperatur for destruktion opnås. En anden fordel er også, at et afkølet sonarhoved og dets elektriske modstand falder ved afkøling, hvorfor der yderligere her også opnås en fordel, blandt andet at man nu kan koble som
15 køre sonarhovederne mere stabilt indefor et mindre temperaturområde.

En yderligere fordel er også, at man ved et kontinuert skift mellem hovederne yderligere opnår en øget virkningsgrad af arrangementet. Idet et skift og stop ændre kavitationsforholdene, således at kavitationen eller emulgeringen kan blive mere aktiv eller holde sig optimal igang i væsken

20 I en særlig udførselsform for arrangementet ifølge opfindelsen, da kan man yderligere fremme kavitationen som emulgeringen af væsken ved at køre systemet under arbejdsforhold med eller under ekstrem høje arbejdstryk som eksempelvis 16 bar, og med opholdstid af premixen eller forblandingen
25 i ultralydsfeltet på ideelt omkring 20-25 sekunder, hvor man så samtidig her i eller på hver enkelt transducer yderligere benytter pulserende ultralydssignaler med væsentlig højere maximumimpulser som her er højere end den aktuelle transducer vil tillade ved en kontinuert drift.

Der opnås herved, at systemet kan køre under vanskelig kavitationsforhold som det høje tryk som generelt korte bearbejdnings tid angiver, samtidig med
30 at man med pulserende ultralydssignaler med større maximumimpulser, opnår at kunne opretholde en ekstremt stor kavitationsydelse og hermed en optimal emulgering som homogenisering af væsken i blandedekammeret.

35 I en anden særlig udførselsform for arrangementet jævnfør opfindelsen, da arbejder systemet i blandedekammeret med homogeniseringen som emulgeringen med arbejdstryk på omkring 16 bar, og med pulserende ultralydssignaler med højere maximumimpulser end hver transducer ved
40 kontinuert drift kan holde til, samt med et løbende hvile/kørsel funktions-rif af transducerne, og med en samtidig pulserede kørsel på mellem 15-120 kHz, eller ideelt mellem 20 -50 kHz, og for et væskeflow på ideelt 4000 liter pr. time.

Der opnås herved, at kørselen inden for nævnte frekvensgrænser og inden
45 for nævnte kørselsmåde optimerer som muliggøre en kontinuert homogenisering som emulgering af generelt specifikke væskeflow eller vækestofmængder i en aktuelle størrelses blandedekammer.

I en anden særlig udførselsform for arrangementet ifølge opfindelsen, da kan man lade lamellerne rotere.

- 5 Der opnås herved yderligere en kavitations-effekt som opstår ved anslaget af væsken imod den roterende enkelte lamel eller lamelkrans eller ligende arrangement. Idet hastigheden af væsken ved anslaget accelereres/decelereres yderligere afhængig af omdrejningsretning som anslagspunkt.

10

I en anden udførselsform for arrangementet ifølge opfindelsen, da kan en yderligere samtidig rotation opnås af både lamelkransene som holder de enkelte lameller. Og lamellerne kan også bringes til at rotere om deres egen aksel.

- 15 Der opnås herved en yderligere homogeniseringseffekt, som specielt kunne forstærkes ved valg af rotationsretning som omdrejningshastighed af lamellerne som af selve kransen. Og dette kunne godt være modsat af hinanden, eller med forskellig omdrejningshastighed.

- 20 I en anden yderligere udførselsform for arrangementet ifølge opfindelsen, da kan emulgeringseffekten øges yderligere ved, at man samtidig udformer lamellerne snoede eller i spiralform i længderetningen.

- Der opnås herved at tilbageslaget af væsken fra den roterende lamel set i længderetningen da ikke får samme retning set i længdesnit, og samtidig vil
25 væsken ikke kun blive slynget vandret ud, men i skrå retning afhængig af stigningen på lamellens spiralformen. Og idet så lamellen rotere så vil næste væskemængde gå i en anden skrå retning, hvorfor en optimal emulgering herved opnås.

30

Opfindelsen forklares nærmere i det følgende under henvisning til tegningen , hvor

- Fig.1 viser i perspektiv et ultralydskammer for homogenisering som
35 emulgering af væske, med ledeplader og kørsel af ultralydstransducere i forskudt rækkefølge,-

- Fig.2 viser en krans af lamel-eller ledeplader som rotere samlet om/i
40 ultralydskammerets centeraksel,-

- Fig.3 viser i perspektiv og set fra siden en enkelt lodret lamel-eller
ledeplade, som rotere om sig selv,-

- Fig.3B viser en enkelt roterende lamel-eller ledeplade som Fig.3, men
45 set fra oven, og

Fig.4 viser et billed af pulserende styret ultralydssignaler.

Fig.1 viser i perspektiv et ultralydskammer 1 for homogenisering som emulgering af væske(r) I som II, med ledeplader 2 og kørsel af 5 ultralydstransducerne 4 i forskudt rækkefølge.

Figuren viser et eksempel på en udførselsform med lodret stående kammer 1 eller en beholder 1 som danner et tryksikkeret mixkammer 1.

10 For oven i mix-kammeret 1 jævnfør figuren (Fig.1) kan der ideelt eksempelvis tilføres væske henholdsvis I som II, som ønskes sammenblandet og homogeniseret til et fælles afgangsmix 8, som eksempelvis en emulsion 8. Væskerne I som II som i udførselseksemplet bliver tilført fra oven i 15 mixkammeret 1 bliver umiddelbart herefter påvirket af et skovhjulssarrangement 3, hvor da nu den nu delvis sammenblandede væske I som II via skovhjulene 3 bliver slynget ud imod ledepladerne 2, og samtidig på grund af at væskerne I som II kontinuert bliver tilført fra oven via 20 tilledningerne, så vil den delvis homogeniserede væske blive ført imod bunden af kammeret 1 til afgangsledningen 8 og til viderebehandling via ultralydstransducerne 4.

Ultralydsarrangementet 4 kan som vist i figuren ideelt eksempelvis bestå af 4 ultralydstransducere 4, som eksempelvis kunne virke i området fra 18 -120 25 kHz, dog som her ideelt eksempelvis i området 20-50 kHz.

En ideelt arbejdsgang for transducerne 4 vil være ved en kontinuert omskiftning 5 som "rif" 5 imellem disse. Således , at nogle 4 køre, og andre 4 ikke. Eksempelvis ved, at man køre med tre 4 ad gangen, og så fremdeles succesivt. Eksempelvis med drejning af een transducer 4 frem, eksempelvis 30 med drejning 5 med som alternativ imod uret. Og eksempelvis ideelt ved at køre tre transducere 4 ad gangen. Hvor i øvrigt den ene transducer 4 kontinuert i sit "rif" 5 vil være ny.

35 Fordelen ved denne kørselsform 5 vil være, at man mindsker virkningen af "crosstalk". Hvilket vil sige, at transducerne 4 virker som modtager af mekanisk energi, der transformeres til elektrisk energi, og således ender som varme i de elektriske generatorer, der driver transducerne 4.

Med den anviste omskiftning 5 og jævnfør opfindelsen, så giver denne kørselsform 5 mulighed for, at køle transducerne 4 regelmæssigt. Hvilket 40 tjener til, at forbedre stabiliteten af impedansen som resonansfrekvensen. Og i øvrigt forlænger denne kørsel 5 eller driftsform 5 desuden levetiden af udstyret 4.

45 Ved yderligere at køre transducerne 4 med pulserende kavitation 7, så opnår man i tillæg en optimal og total homogenisering af de til mix-kammeret 1 tilførte væsker I som II som eventuelt flydende masser. Idet man da qua denne metode 7, ved en pulserende kavitation kombineret med rif -kørsel af

transducerne selv under samtidig store arbejdsstryk som eksempelvis 16 bar opnår at skabe et ekstremt tæt kavitationsfelt. Og hvor dette så kan vedligeholdes af de efterfølgende "svage" signaler 10.

- 5 Fig.2 viser en krans af lamel-eller ledeplader 2 som rotere 9 samlet om/i ultralydskammeret 1 centeraksel.

Systemet 2 kunne bestå af et, som alternativ flere roterbarer 9 ringssystemer eller kranse 9' med lodret sidende lamel-eller ledeplader 2. Hvor disse 2 eller 10 kranse 9' så måske alternativt ideelt kunne køre modsat hinanden 2 som 9', eller måske med forskellig hastighed eller begge dele i kombination.

Når lamel-eller ledepladerne 2 rotere 9, så vil dette her medfører en ekstra opblanding af de tilførte væsker I som II. Og især, hvis de tilførte væsker I 15 som II på forhånd allerede er forblendet ved et skovhjulsarrangement 3 i midten af mix-kammeret 1.

Fig.3 viser i perspektiv og set fra siden en enkelt lodret lamel-eller ledeplade 2, som rotere om sig selv. 20 Arrangementet 2 kunne selvfølgelig også kombineres med det system som er vist i Fig.2.

Systemet vil især have en ekstra effekt, hvis systemet drejer modsat af, hvad det midterste skovhjuls-arrangement 3 gør.

25 Fig.4 viser et billed af et pulserende 7 ultralydssignal 10 som køres som et hele, og som en del af rif-kørselen af ultralydstransducerne 4 som køre i forskudt rækkefølge 5 med een transducer 4 i hvile, hvorved der ved denne opsummerede kørsel opnås en synergieffekt i effektivitet af den totale homogeniseringseffekt, som er større end man kunne forvente, med 30 eller ved hver af de enkelte del-operationer eller driftsformer 5 som 7 kørt for sig og uden den anden driftsform som supplement eller overbygning.

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Patentkrav

- 5 1. Fremgangsmåde for kontinuerlig homogenisering eller emulgering af væske (I som II), hvor væsken (I som II) i et ultralydskammer (1) med lameller (2) eller (ledeplader (2), især placeret i yderranden af kammeret (1), men også områder op hertil, underkastes en kinematiskmekanisk behandling eksempelvis ved omrøring (3), og i en
10 kontinuerlig strøm ledes forbi overfladen på flere ultralydsgeneratorer (4), **k e n d e t e g n e t v e d**, at et flertal af ultralydstransducere (4) køre i forskudt rækkefølge (5), med mindst 1 transducer (4) i skift som er i hvile.
- 15 2. Ultralydsapparat for kontinuerlig homogenisering ifølge krav 1, **k e n d e t e g n e t v e d**, at kunne fremme kavitationen som emulgeringen af væsken (I som II), ved at køre systemet under arbejdsforhold med eller under ekstreme arbejdstryk som eksempelvis 16 bar, og med opholdstider på ideelt omkring 20-25 sekunder, og hvor man så samtidig på hver enkelt
20 transducer (4) benytter pulserende ultralydssignaler (7) med væsentlig højere maximumimpulser (10) som er højere (10) end den aktuelle transducer (4) vil tillade under en kontinuert drift.
- 25 3. Ultralydsapparat for kontinuerlig homogenisering ifølge krav 1 som 2, **k e n d e t e g n e t v e d**, at man køre de pulserende ultralydssignaler (7) som løbende (5) hvile/kørsel funktions-rif (5) og med en samtidig frekvens (10') på mellem 15-120 kHz, eller ideelt på mellem 20-50 kHz.
- 30 4. Ultralydsapparat for kontinuerlig homogenisering ifølge krav 1. **k e n d e t e g n e t v e d**, at lamellerne (2) i blandedekammeret (1) under drift kan bibringes en roterende bevægelse (9).
- 35 5. Ultralydsapparat for kontinuerlig homogenisering ifølge krav 1, **k e n d e t e g n e t v e d**, at have en som flere lamelkranse (9') i blandedekammeret (1) som kan roterer (9) om sig selv, alternativt at have en som flere lamelkranse (9'), hvor hver enkelt lamel (2) kan rotere om sig selv, som alternativt en udførselsform, hvor man kan kombinere begge rotationssystemer.
- 40 6. Ultralydsapparat for kontinuerlig homogenisering ifølge krav 1, **k e n d e t e g n e t v e d**, at hver lamel (2) i blandedekammeret (1) i sig selv yderligere kan være udført snoet-eller i en spiralform eller i en lignende udførselsform.
- 45

5

SAMMENDRAG

10 Fremgangsmåde som et apparatur for kontinuerlig homogenisering eller emulgering af væske, hvor væsken i et ultralydskammer med lameller eller ledeplader, især placeret i yderranden af kammeret, men også med eventuel placering i området op hertil, underkastets en kinamatisk-mekansk behandling eksempelvis ved omrøring, og med en kontinuerlig væske som herefter ledes forbi overfladen af flere ultralydstransducere, hvor transducerne køre i forskudt rækkefølge, med mindst een transducer i skift som er i hvile.

Reson
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09/889724

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Dato: 5. juli 2001

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Vores ref: PA 1999 00296/P5/SG
Deres ref: Int. homogen
Frist: 5. januar 2002

Reson A/S

2. behandling

Svar på Deres breve af 01. december 1999 og 26. juni 2001.

1. Vi mener, Deres ansøgning kan føre til patent, da vi kan godkende omfanget af Deres nye krav. De må dog rette kravene jfr. de vedføjede bemærkninger, så de bliver mere forståelige, bl.a. må udtrykket "hvile/kørsel funktions-rif" erstattes af et forståeligt teknisk udtryk.

2. De må også rette beskrivelsen jfr. de mange vedføjede bemærkninger.

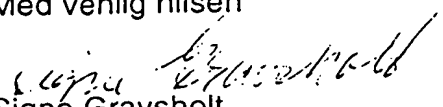
3. De er velkommen til at indsende kommentarer, som skal indgå i den videre sagsbehandling. Hvis vi hverken modtager kommentarer eller nye bilag til ansøgningen inden udløbet af den frist, der er nævnt ovenfor, henlægger vi ansøgningen, dvs. vi indstiller behandlingen indtil videre.

Vi genoptager dog behandlingen, hvis vi inden 4 måneder efter, at fristen er udløbet, modtager Deres kommentarer eller nye bilag og det fastsatte gebyr på 700 kr. for

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genoptagelsen. Hører vi derimod stadigvæk ikke fra Dem, indstiller vi behandlingen endeligt.

Med venlig hilsen


Signe Gravsholt
Civilingeniør

ie/

Bilag: Beskrivelse med krav af 01. december 1999.